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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

HARAN, JOHN T

ART UNIT

PAPER NUMBER

1733

15

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Please find below and/or attached an Office communication concerning this application or proceeding.

AS-15

Office Action Summary

Application No.

09/480,076

Applicant(s)

LAKE, RICKIE C.

Examiner

John T. Haran

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 August 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 9, 10, 12-14, 23-28 and 51-54 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) ~~23-28, 53 and 54~~ is/are allowed.
- 6) ☒ Claim(s) 9-10, 12-14, ²³⁻²⁸ and ⁴51-52 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☒ Interview Summary (PTO-413) Paper No(s). 11.
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____. 6) ☐ Other: _____.

DETAILED ACTION

1. This action is in response to the filing of a CPA request and amendment D filed on 8/22/02. The 35 USC 112, 2nd paragraph indefiniteness rejection of the claims and the 35 USC 103 (a) obviousness rejection of claims 23-28 are withdrawn in light of Applicant's arguments.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 9 and 12 are rejected under 35 U.S.C. 102(b) as being anticipated by Kropp et al (U.S. Patent 5,362,421).

Kropp et al disclose a method of conductively interconnecting electronic components by interposing a curable, electrically conductive adhesive composition comprising an epoxy with a glycidoxypolytrimethoxysilane coupling agent between a first and second electronic component and then curing the adhesive to create an electrically conductive bond that electrically interconnects the first and second components (Abstract, Column 6, lines 1-8). Kropp et al clearly anticipate claims 9 and 12.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 13-14 and 51-52 rejected under 35 U.S.C. 103(a) as being unpatentable over Kropp et al (U.S. Patent 5,362,241).

Regarding claims 13 and 14, Kropp et al is silent towards the weight percent of epoxy terminated silane, however it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the desired weight percentages of the epoxy terminated silane in the adhesive composition in the method of Kropp et al and only the expected would be achieved.

Regarding claims 51 and 52, it is well known and conventional in the art to electrically interconnect two electronic components that each has a node that comprises an interface for electrically interconnecting the two components and for the adhesive to contact the interfaces. It would have been obvious to one of ordinary skill in the art at the time the invention was made to electrically interconnect two electronic components, each having a node that comprises an interface, wherein the adhesive contacts the nodes in the method of Kropp et al.

6. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kropp et al as applied to claim 9 above, and further in view of Tuttle (U.S. Patent 5,558,679).

One skilled in the art would have readily appreciated that it is well known and conventional to electrically interconnect electronic components via an epoxy adhesive wherein one of the electronic components a surface with metal containing nickel, as

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shown for example in Tuttle (Column 3, lines 60-61) and that Kropp et al are a general teaching for interconnecting electronic parts. It would have been obvious to one of ordinary skill in the art at the time the invention was made to connect an electrical component with a nickel containing metal surface to another electrical component in the method of Kropp et al as suggested in Tuttle.

7. Claims 9, 12-14 and 51-52 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al (U.S. Patent 4,975,221) in view of Tsukagoshi et al (U.S. Patent 5,843,251), Kropp et al (U.S. Patent 5,362,421), or Inoue et al (U.S. Patent 5,728,473).

Chen et al discloses a curable epoxy adhesive for use in attaching electrical components together, such as semiconductor die or chips to a substrate, to form a connection wherein the epoxy adhesive contains an electrically conductive filler and an epoxy functional silane adhesion promotor (Column 1, lines 5-11 and Column 3, line 59 to Column 4, line 5).

While Chen et al is silent towards the specifics of using the adhesive to electrically interconnect electrical components, it would have been obvious to one of ordinary skill in the art at the time the invention was made that in order to form an electrical connection between two electrical components with an adhesive, the adhesive must be interposed between the components and cured.

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Chen et al are silent towards the type of silane utilized as the adhesion promotor, however Chen et al do teach any type of epoxy terminated silanes are suitable as the adhesion promotor (Column 4, lines 4-5).

Glycidoxy methoxy silanes are well known and conventional adhesion promoters/coupling agents, as evidenced for example in Tsukagoshi et al, Kropp et al, and Inoue et al. Tsukagoshi et al is directed to a method for electrically connecting circuits by interposing an epoxy adhesive between two circuits (Column 3, lines 30-35). The reference teaches adding a silane coupling agent to the epoxy in order to strengthening the adhesive interface of the circuits and to improve moisture resistance, such as glycidoxypropyltrimethoxysilane (Column 10, line 62 to Column 11, line 12). Kropp et al also teach adding a silane coupling agent to a curable, electrically conductive epoxy adhesive such as glycidoxypropyltrimethoxysilane for interconnecting electronic parts (Abstract, Column 6, lines 1-9). Inoue et al also teach adding a silane coupling agent to a curable epoxy adhesive such as glycidoxypropyltrimethoxysilane for interconnecting electronic components.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize a known silane adhesion promotor, such as glycidoxypropyltrimethoxysilane, in the epoxy adhesive in the method of Chen et al.

Regarding claims 13-14, it would have been obvious to utilize the desired weight percentages of the epoxy terminated silane in the adhesive composition and only the expected would be achieved. Furthermore, Chen et al teach having the adhesion promotor be 0 to 2 percent by weight (Column 4, lines 15-20).

Regarding claims 51 and 52, it is well known and conventional in the art to electrically interconnect two electronic components that each has a node that comprises an interface for electrically interconnecting the two components and for the adhesive to contact the interfaces. It would have been obvious to one of ordinary skill in the art at the time the invention was made to electrically interconnect two electronic components, each having a node that comprises an interface, wherein the adhesive contacts the nodes in the method of Chen et al.

8. Claims 23-27 and 53-54 are rejected under 35 U.S.C. 103(a) as obvious over Chen et al (U.S. Patent 4,975,221).

Chen et al disclose a curable epoxy adhesive for use in attaching electrical components together, such as semiconductor die or chips to a substrate, to form an electrical connection wherein the epoxy adhesive contains an electrically conductive filler and an epoxy functional silane adhesion promotor (Column 1, lines 5-11 and Column 3, line 59 to Column 4, line 5).

While Chen et al is silent towards the specifics of using the adhesive to electrically interconnect electrical components, it would have been obvious to one of ordinary skill in the art at the time the invention was made that in order to form an electrical connection between two electrical components with an adhesive, the adhesive must be interposed between the components and cured.

One skilled in the art also would have readily appreciated that it is notoriously well known and conventional when electrically connecting a semiconductor chip to a

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substrate that both the chip and the substrate have metal contact sites. It would have been obvious that the epoxy contacts the metal contact sites to electrically connect the chip and substrate.

Applicant teaches that the concentration of silane in an epoxy terminated silane lowers the resistance of the adhesive and thereby lowers the contact resistance through a metal surface (Specification, page 6, line 15 to page 7 line 10). While Chen is silent towards the epoxy having an effective metal surface wetting concentration of silane that results in a contact resistance through the metal surface of less than or equal to about .032 ohm-cm², Chen et al disclose the composition of the epoxy adhesive listing each component in terms of part by weight (See Column 4, lines 15-21). Applicant teaches that the effective concentration of the silane needed to obtain the desired contact resistances is less than 2% by weight and preferably less than 1% by weight (Specification, page 6, line 15 to page 7 line 10). It is clear from the composition listing in Chen et al that the adhesion promoter (epoxy functional silane) comprises less than 1% by weight. One skilled in the art would have readily appreciated that the concentration of silane taught in the adhesive of Chen et al is within the effective concentration range taught by Applicant and that therefore it would be expected for the adhesive of Chen et al to have a contact resistance of the desired values (i.e. less than .3, .16, or .032 ohm-cm²).

It would have been obvious to interpose the epoxy adhesive having the disclosed composition between a semiconductor chip and a substrate, both having metal contact sites, and to then cure the adhesive into an electrically conductive bond electrically

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interconnecting the chip and substrate via the metal contact sites wherein the concentration of silane in the epoxy results in a contact resistance through the metal contact sites of the desired values in the method of Chen et al.

Regarding claims 53-54, it is well known and conventional in the art to electrically interconnect two electronic components that each has a node that comprises an interface for electrically interconnecting the two components and for the adhesive to contact the interfaces. It would have been obvious to one of ordinary skill in the art at the time the invention was made to electrically interconnect two electronic components, each having a node that comprises an interface, wherein the adhesive contacts the nodes in the method of Chen et al.

9. Claims 10 and 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al in view of Tsukagoshi et al, Kropp et al, and Inoue et al, as applied to claim 9 above and over Chen et al, as applied to claim 23 above, and further in view of Tuttle (U.S. Patent 5,558,679).

One skilled in the art would have readily appreciated that it is well known and conventional to electrically interconnect electronic components via an epoxy adhesive wherein one of the electronic components a surface with metal containing nickel, as shown for example in Tuttle (Column 3, lines 60-61) and that Chen et al are a general teaching for interconnecting electronic parts. It would have been obvious to one of ordinary skill in the art at the time the invention was made to connect an electrical

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component with a nickel containing metal surface to another electrical component in the method of Chen et al, as modified above, as suggested in Tuttle.

Response to Arguments

10. Applicant's arguments filed 8/22/02 have been fully considered but they are not persuasive.

In regards to claim 9, there is ample motivation to modify Chen et al with Tsukagoshi et al, Kropp et al, or Inoue et al. Chen et al teach electrically interconnecting electrical components with an adhesive containing epoxy terminated silanes as adhesion promoters. It is well known and conventional that glycidoxymethoxy silanes, such as glycidoxypolytrimethoxysilane, are adhesion promoters/coupling agents, as shown for example Tsukagoshi et al, Kropp et al, or Inoue et al. One skilled in the art would have had ample motivation to use epoxy terminated silanes that are well known and conventional in the adhesive and bonding art in the method of Chen et al.

In regards to claim 23, Applicant teaches that the effective concentration of the silane to get the desired contact resistance is less than 2% by weight. Chen et al disclose a curable, electrically conductive epoxy adhesive with an epoxy functional silane as an adhesion promotor within the same concentration range as taught by Applicant and therefore it would be expected for the adhesive of Chen et al to have the desired contact resistance.

Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Arndt et al (U.S. Patent 5,532,024) teaches using epoxy adhesive with silane coupling agents, such as glycidoxypropyltrimethoxysilane, in order to increase adhesion with nickel surfaces (Column 2, lines 44-55).


12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to **John T. Haran** whose telephone number is **(703) 305-0052**. The examiner can normally be reached on M-Th (8 - 5) and alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael W. Ball can be reached on (703) 308-2058. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.


John T. Haran

October 4, 2002


Michael W. Ball
Supervisory Patent Examiner
Technology Center 1733